SOME ADDITIONS TO THE CALIFORNIA MOSS FLORA

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Considerable work has been done on the moss flora of California during recent years, and a firm basis has been laid for further floristic studies by the publication of a checklist of California mosses by Koch (1950). The size of the state and the extreme diversity of available habitats make it probable, however, that many more species will be discovered in California, not only by careful collecting but also by critical study of many difficult genera, particularly of the Pottiaceae and the Brachytheciaceae. Recently, from 1954 to 1956, Wilfred B. Schofield of Wolfville, Nova Scotia, made a sizable and very interesting collection of mosses in central California, mostly in the San Francisco Bay region. In addition to many rarities previously recorded from the area, he found one very distinctive new species and several important range extensions which are reported below. A few additional specimens worthy of recording here were sent me for determination or confirmation by Mrs. Fay A. MacFadden of Los Angeles. All the specimens are deposited in the Herbarium of the National Museum of Canada (CAN).

Hymenostomum (Kleioweisia) **inoperculatum** sp. nov. (Figs. 1–6). Planta tenella, usque ad 1 mm., sordido-viridis, paucifoliatus, folia usque ad 2 mm. longa, madida patula, sicca crispula, inferiora minuta et ovata, caetera sensim major, oblongo-lanceolata, acuta et apiculata, concava, marginibus integerrimis, superne late involutis; costa basi 48–56μ, breviter excurrens; cellulae basilares in dimidio inferiore hyalinae, oblongae, parietibus tenuibus, cellulae laminae superioris hexagonae, opacae, densissime papillosae, dioicum (?); flos masculae non vidi, seta 3 mm. longa, pallida, erecta; capsula 1.25–1.75 mm. longa, exserta, erecta, oblongo-cylindrica, oblique et longe rostrata, clausa, sine operculo, sporae 16–19μ, minute et dense papillosae.

Type. On soil in garden in front of Sequoia Hall, Stanford University, Santa Clara County, California, February, 1955, *W. B. Schofield* (*s.n.*); growing with *Pottia arizonica* var. *mucronulata* Wareham (CAN).

This species is distinct from all other American species of *Hymenostomum* known to me in having clearly exserted, cleistocarpous capsules. It is related, perhaps most closely, to *H. exsertum* (Broth.) Broth. of China and Japan, but judging from the single Japanese specimen which I have seen, named by Dr. Akira Noguchi and kindly communicated by Dr. Harumi Ochi, the Californian species differs markedly in having much shorter and relatively broader leaves which are less strongly crisped when dry and capsules which are narrower and cylindric to subelliptic, rather than subglobose, and end in longer, more slender beaks. A further difference is that the capsules are clearly exserted, and the setae much exceed the uppermost leaves in length, whereas in *H. exsertum,* although the

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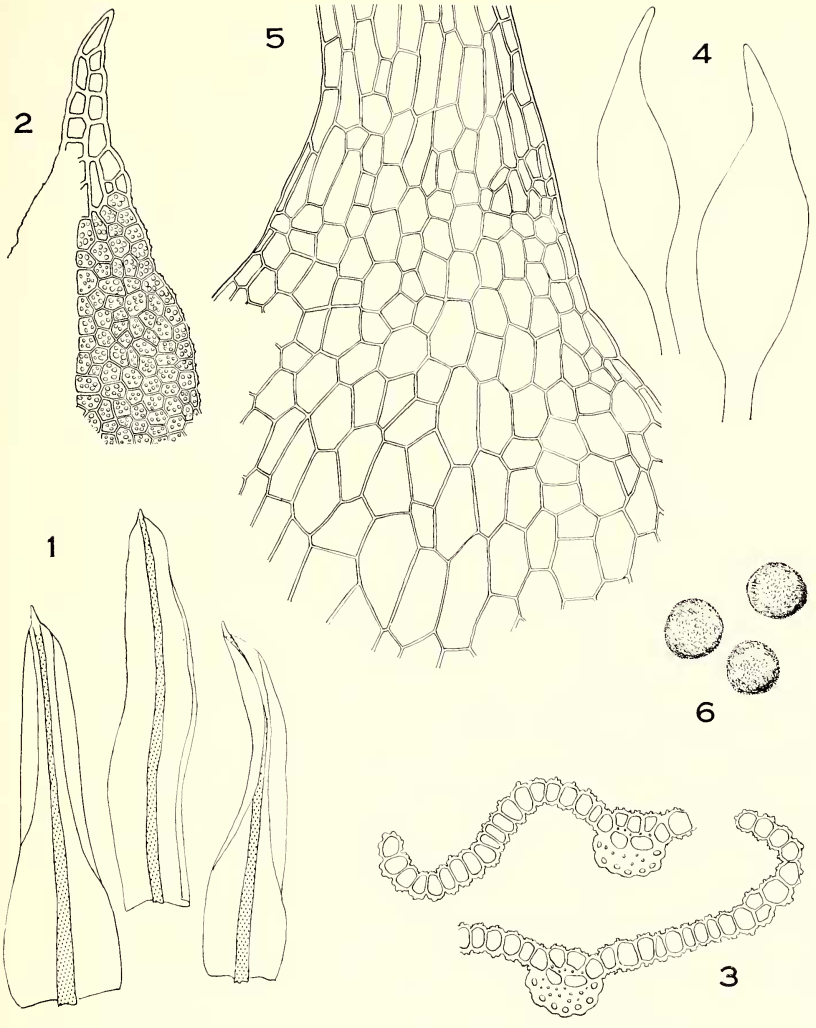


FIGS. 1–6. *Hymenostomum inoperculatum*. 1, leaves, × 30; 2, upper cells of leaf and apiculus, × 275; 3, two sections taken in upper portion of leaf, × 275; 4, two capsules, × 30; 5, areolation of capsule wall showing the irregularity of cells at the zone of dehiscence in most other species of mosses, × 275; 6, spores, × 520.

setae are fairly long and the capsules appear to be exserted, they are actually surpassed in length by the strongly contorted and spreading upper leaves. *Hymenostomum inoperculatum* conforms very well to the description of *H. semidiaphanum* Thér. of Mexico, but the type of that species was examined and found to be inaccurately characterized. The operculum is clearly differentiated and not "haud secedens." (Thériot was probably

misled by the juvenile development of the capsules in the type collection of *H. semidiaphanum*.) The position of *H. semidiaphanum* in the subgenus *Kleioweisia* seems highly unlikely.

Pottia arizonica var. mucronulata Wareham. On soil in garden in front of Sequoia Hall, Stanford University, Santa Clara County, February, 1955, *W. B. Schofield* (*s.n.*). I have examined the only previous California collection, from Los Angeles County (Koch, 1950), as well as the type from Arizona.

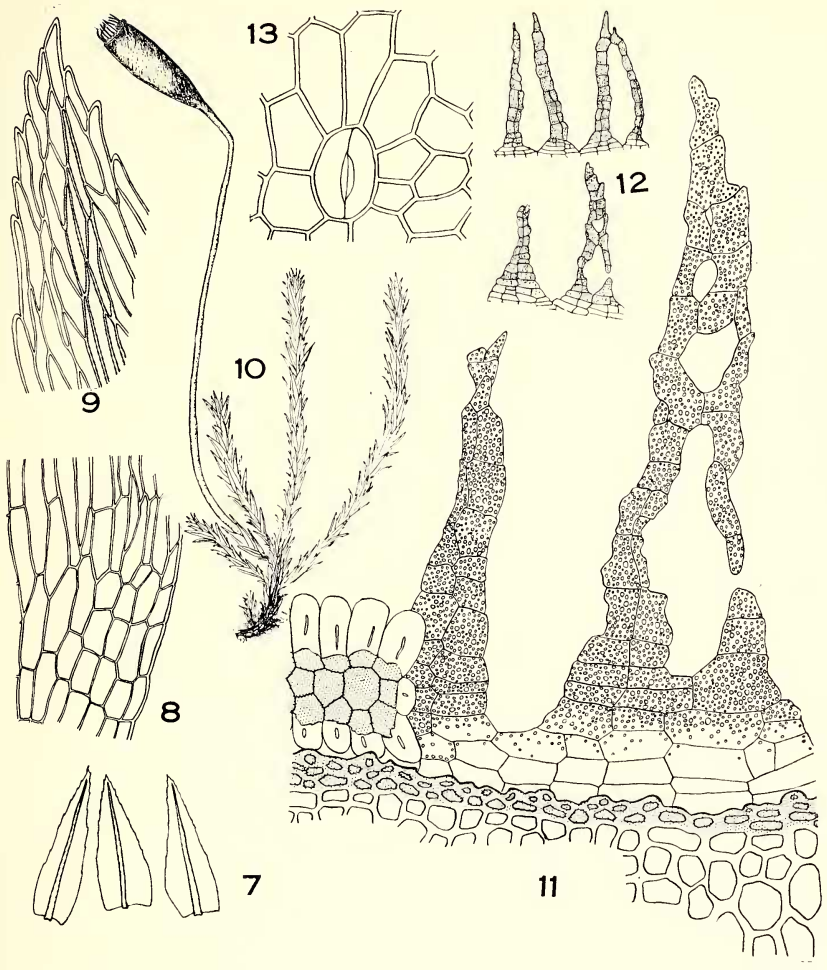
Stegonia latifolia var. pilifera (Brid.) Broth. This interesting moss, previously known only from the Yukon and from the Canadian Rocky Mountains in North America, was collected among rocks at 13,950 feet altitude on Mount Barnard, Tulare County, by Peter H. Raven on July 25, 1955. The specimen was sent me by Mrs. MacFadden.

Tortula stanfordensis Steere. On moist, hard-packed soil of open area, Purissima Creek, San Mateo County, November 8, 1955, *W. B. Schofield 6322*. This species, recently described from Santa Clara County (Steere, 1951), has also been reported from Alameda County (Koch & Ikenberry, 1954).

Grimmia mariniana Sayre. Dark, hyaline-tipped cushions among boulder crevices, Mount Tamalpais, Marin County, March 26, 1955, *W. B. Schofield 5798*; steep, exposed rocks, east side of East Peak, Mount Tamalpais, Marin County, April 8, 1956, *John T. Howell H184* (comm. Mrs. MacFadden). Both of these specimens come from the general vicinity of the type locality and conform very well to Sayre's recent description (1955), except that the alar cells of the leaves have thickened cross-walls, a character which Sayre perhaps overlooked.

Ephemerum minutissimum Lindb. Locally abundant on small, clayey patches in an open field, Big Basin, Santa Cruz County, March 24, 1956, *W. B. Schofield 6450*; local, on bare patches near margin of field, near Ventura Hall, Stanford University, Santa Clara County, February 23, 1955, *W. B. Schofield 5723*. Duplicates of these specimens were sent to Dr. Virginia S. Bryan, who confirmed the determinations tentatively, pending further understanding of the puzzling variation exhibited by *E. serratum* and *E. minutissimum* in the West. Koch (1950) listed only *E. serratum* (Hedw.) Hampe from California, where it had been collected only once, in San Francisco. Grout (1928–40) mentioned only Massachusetts and Saskatchewan in the distribution of *E. minutissimum*.

Mielichhoferia mielichhoferiana (Funck) Limpr. (figs. 7–13). On a tree trunk, Little Butano Creek, Santa Clara County, November 6, 1954, *W. B. Schofield 5748*. Extremely rare and localized in its distribution, this species has been collected in only a few other widely separated places in North America (in the Lake Superior region of Michigan and Ontario and also in Maine). In the Old World it is known from Scandinavia, the Alps and elsewhere in Central Europe, the Pyrenees, and the Caucasus. The plants which Mr. Schofield collected in the Coast Ranges



FIGS. 7–13. *Mielichhoferia mielichhoferiana*. 7, leaves, × 23; 8, basal cells of leaf, × 205; 9, upper cells of leaf, × 205; 10, habit of fruiting plant, × 8; 11, portion of peristome, annulus, and upper exothecial region, × 205; 12, portions of peristomes, showing variation in shape of teeth, × 65; 13, cells from neck of capsule showing stoma, × 205.

of central California seem to me typical in every structural detail and only slightly different in habit of growth, as they are somewhat more elongate, less densely compacted in tufts and more loosely and freely branched than any other material that I have examined, although they greatly resemble in growth form the illustrations given in the "Bryologia Europaea" (plate 328, as *M. nitida* Hornsch.) and reproduced in Grout's "Moss Flora of North America." These differences are indeed slight and almost

surely not of a genetic nature, and they are doubtless associated with the unusual habitat in which the plants were found, namely, on the bark of a tree. Insofar as I have been able to ascertain, the species has never before been reported from any substrate other than rock and, more specifically, from rocks containing alum or iron and copper ions. Persson (1948) has recently reviewed the evidence for believing that the genus *Mielichhoferia* shows a predilection for copper-containing rocks.

More typically developed, though sterile, plants of a *Mielichhoferia,* tentatively named *M. mielichhoferiana* by A. LeRoy Andrews, were also collected in California by John Thomas Howell "on shaded, moist rock, Merced River Canyon, just above Briceburg, Mariposa County." They were recently sent to me by Mrs. MacFadden, and I see no reason to doubt the determination.

I have prepared the accompanying camera lucida drawings in order to give greater publicity to *M. mielichhoferiana,* as this interesting and rarely collected species has not been illustrated from American material before. It should be noted that the shape of the capsule varies with age. When old, empty and somewhat wrinkled, it is oblong-cylindric, but when operculate, it is more ovoid with a more distinct neck.

Zygodon viridissimus (Dicks.) Brown. In crevices of bark of *Lithocarpus,* forming small patches, Big Basin, Santa Cruz County, November 27, 1955, *W. B. Schofield 6371.* Subsequent to the publication of his checklist, Koch (1950a) reported this species for the first time from California, from a collection made in Humboldt County.

Brachythecium washingtonianum Eaton ex Grout. On shaded soil bank, Purissima Creek, San Mateo County, November 8, 1956, *W. B. Schofield 6337*; on wet bank, same locality and date, *6346*; rock outcropping of brook bank, Big Basin, Santa Cruz County, November 27, 1955, *W. B. Schofield 6357.* Koch (1950) listed three collections of this species from Trinity, Siskiyou, and Humboldt counties. These collections extend the range southward considerably. I have studied the type, which comes from Washington. The alar cells of the stem leaves are large and lax and much more clearly differentiated than Grout (1928–40) indicated and seem to me indicative of a clearer relationship to *B. rivulare* B.S.G. than Grout appears to have realized.

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Sayre, Geneva. 1955. Grimmia mariniana, a new species from California. The Bryologist 58:323–325. Fig. 1.
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REVIEW

The Genus Nicotiana. By T. H. Goodspeed. xxi + 536 pp., illustrated. Chronica Botanica Vol. 16, No. 1/6. 1954. Waltham, Mass.: The Chronica Botanica Co.; San Francisco, Calif.: J. W. Stacey, Inc. Buckram. $12.50.

According to Professor Goodspeed: "The primary objective of the *Nicotiana* investigations . . . has been the accumulation of evidence bearing upon the origin, evolution and relationships of the modern species of the genus (p. 1)." Merely as a general presentation of this accumulated information this book is impressive. As Volume 16 of *Chronica Botanica,* it contains some 536 pages, 50 tables, and 118 plates as well as text-figures. Studies in distribution, morphology, and cytogenetics (comprising the first four parts of the book), many of which began as long ago as 1904, are discussed in detail. The important contributions of the *Nicotiana* work to general genetics and cytology are not touched upon, however, for obvious reasons. It is very useful, of course, to have all of this material, which has appeared in many different journals over the years, brought together and integrated. One cannot fail to be impressed with the Olympian outlook of the author as he discusses a genus which has contributed so much to an understanding of basic biological problems. One must always keep in mind, however, that, in a summary work of this sort, there is a great deal more interpretation, or even opinion, than in the individual contributions.

Part I is concerned with the evidence from distribution. Since there is no paleobotanical evidence to use in determining past distribution, Goodspeed discusses in detail the present distribution upon the major land masses. Much of this is repetitive from chapter to chapter and speculative, and suffers from the defects of reasoning based upon patterns of distribution. It may be true that in paleontology one must assume that the present is the key to the past. But when one is dealing with patterns of geographical occurrence he never has all of the requisite facts of present-day ecology and genetics to make an adequate judgment of the factors involved in the past. Nevertheless, Goodspeed deduces that *Nicotiana* originated in South America in the early Tertiary, thence spreading to North America and across Antarctica to Australia, New Zealand, and the islands of the South Pacific. The bases for these deductions appear to be primarily the times at which the various land masses involved became joined or separated and the presumed length of time for a particular "quantity" of evolution to have taken place. The limits of error of these two criteria have scarcely been securely set. But then this is more or less standard operating procedure in taxonomic problems and has been for some time.

All but four of the sixty recognized species of *Nicotiana* have been grown in the greenhouse or field and have been available for experimental studies. Morphological and anatomical investigations have been carried out on all. Goodspeed limits his discussion to general morphology, anatomy, and trichomes (Part II), cytology of species (Part III), and cytology of F_1 interspecific hybrids (Part IV). *Nicotiana* is not characterized by any one specialized feature and there is marked variation between species in habit, inflorescence, and flower, all of which is well illustrated. As one would expect, the majority of anatomical distinctions are quantitative and thus of less use at the level of species. Goodspeed attaches especial importance to the trichomes which are believed to follow patterns paralleling those developed from studies of general morphology, geographical distribution, and cytogenetics.

An especially interesting part of the book for me is the section on the cytology of